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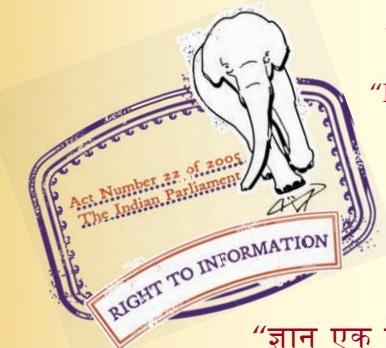
“Step Out From the Old to the New”

IS 5546 (1981): Distribution Caps and Rotor Arms for Automobiles [TED 11: Automotive Electrical Equipment]

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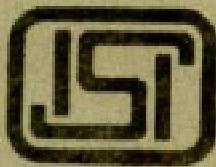
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*Indian Standard*  
**SPECIFICATION FOR**  
**DISTRIBUTION CAPS AND ROTOR ARMS**  
**FOR AUTOMOBILES**  
*( First Revision )*

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**INDIAN STANDARDS INSTITUTION**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

*Indian Standard*  
**SPECIFICATION FOR  
DISTRIBUTION CAPS AND ROTOR ARMS  
FOR AUTOMOBILES**  
*(First Revision)*

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*Indian Standard*

**SPECIFICATION FOR  
DISTRIBUTION CAPS AND ROTOR ARMS  
FOR AUTOMOBILES**

*( First Revision )*

**0. FOREWORD**

**0.1** This Indian Standard ( First Revision ) was adopted by the Indian Standards Institution on 1 September 1981, after the draft finalized by the Automotive Electrical Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

**0.2** This standard was first published in 1970. This revision has been undertaken to include the requirements and methods of tests for rotor arms also in this standard.

**0.3** At the time of preparation of IS : 4086-1967\* it was felt that a standard specification should be established to cover the functional requirements of distributor caps made of thermosetting plastics, and hence this standard.

**0.4** The distributor caps are made of different materials and they are graded depending on the composition as follows:

Grade A — made of thermosetting plastics with mineral filling.

Grade B — made of thermosetting plastics with wood filling.

Because of the superior characteristics of Grade A distributor caps, they can pass the carbonization test ( see 5.3 ). Grade B distributor caps should not be expected to comply with this test.

**0.5** The distributor caps being of different qualities by design, it is essential that they should be easily identified. In view of the wide use of Grade B caps in the country, no marking is generally recommended to be made on them. However, Grade A caps shall be marked with the letter 'A' ( see 4.1 ).

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\*Methods of test for distributors.

**0.6** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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## **1. SCOPE**

**1.1** This standard covers the requirements and methods of tests for distributor caps and rotor arms.

## **2. TERMINOLOGY**

**2.0** For the purpose of this standard, the following definitions shall apply.

**2.1 Type Tests** — Tests carried out to prove conformity with the specification. These are intended to prove the general qualities and design of a given type of distributor cap and rotor arm.

**2.2 Acceptance Tests** — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

**2.3 Routine Tests** — Tests carried out on each distributor cap and rotor arm to check requirements which are likely to vary during production.

## **3. GENERAL REQUIREMENTS FOR DISTRIBUTOR CAPS AND ROTOR ARMS**

**3.1** The distributor caps and rotor arms shall conform to the dimensions and other requirements as specified by the purchaser or as applicable in the relevant Indian Standard.

**3.2** The terminal housing of distributor caps shall be push-in type as given in Fig. 1 or any other type as agreed upon by the manufacturer and the purchaser.

## **4. MARKING**

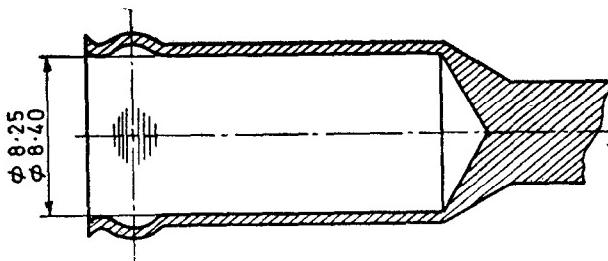
**4.1** The distributor caps shall be marked with the following information:

- a) Name or trade-mark of the manufacturer,
- b) Part number,
- c) Grade, and
- d) Country of manufacture.

NOTE — In case of (c) letter 'A' shall be marked on Grade A caps. No marking need be made if the caps are of Grade B.

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\*Rules for rounding off numerical values (*revised*).



Other dimensions to suit the application.

Material : Brass or aluminium.

FIG. 1 PUSH-IN TYPE HIGH TENSION TERMINATION

**4.2** The rotor arms shall be marked with the following information:

- Name or trade-mark of the manufacturer,
- Part number, and
- The direction of rotation.

**4.3** The distributor caps and rotor arms may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors may be obtained from the Indian Standards Institution.

## 5. TESTS

**5.0 Classification of Tests** — The following shall be the list of tests to be done on distributor caps and rotor arms. The testing authority shall issue a type approval certificate if the distributor caps and rotor arms are found to comply with the requirements of tests given in **5.0.1** and **5.0.2** respectively.

**5.0.1 Type Tests ( Distributor Cap )** — The following shall constitute type tests:

- Visual examination ( see **5.1** ),
- Dimensional check ( see **5.2** ),
- Carbonization test ( see **5.3** ),

- d) Localized heating test ( see 5.4 ),
- e) Dimensional stability test ( see 5.5.1 and 5.5.2 ),
- f) Wet surface resistance test ( see 5.6 ),
- g) High temperature resistance test ( see 5.7 ),
- h) Wet internal resistance test ( see 5.8 ), and
- j) High voltage test ( see 5.9.1 ).

**5.0.1.1 Criteria for approval** — At least fifty five samples of distributor caps of the same type shall be submitted for testing together with the relevant data.

**5.0.1.2** All the fifty five samples shall be tested for:

- a) Visual examination ( see 5.1 ), and
- b) Dimensional check ( see 5.2 ).

**5.0.1.3** Three towers on each of 4 caps shall be subjected to the carbonization test ( see 5.3 ) ( for Grade A caps only ).

**5.0.1.4** All inserts of 4 caps shall be subjected to the localized heating test ( see 5.4 ).

**5.0.1.5** Four caps shall be subjected to the dimensional stability test ( see 5.5.1 and 5.5.2 ).

**5.0.1.6** Ten caps shall be subjected to the wet surface resistance test ( see 5.6 ).

**5.0.1.7** Ten caps shall be subjected to high temperature resistance test ( see 5.7 ).

**5.0.1.8** Three caps shall be subjected to the wet internal resistance test ( see 5.8 ).

**5.0.1.9** Twenty caps shall be subjected to high voltage test ( see 5.9.1 ).

**N**OTE — Caps shall not be used for more than one test. If caps are treated, that is, finished with anti-track paint, then the caps should be tested as finish-treated.

**5.0.1.10** In case of failure of one or more samples, the testing authority may call for fresh samples not exceeding twice the number of original samples and subject them to the test(s) in which failure has occurred. If in the repeat test(s) no failure occurs, the test may be considered to have been satisfied.

**5.0.2 Type Tests ( Rotor Arms )** — The following shall constitute type tests:

- a) Visual examination ( see 5.1 ),
- b) Dimensional check ( see 5.2.1 ),
- c) Dimensional stability test ( see 5.5.3 and 5.5.4 ), and
- d) High voltage test ( see 5.9.2 ).

**5.0.2.1 Criteria for approval** — At least 10 samples of rotor arms divided into two groups of 5 each shall be subjected to type tests. All the rotor arms in the two groups shall pass the test for that group.

**5.0.2.2** All samples shall be tested for:

- a) Visual examination ( see 5.1 ), and
- b) Dimensional check ( see 5.2.1 ).

**5.0.2.3** Five rotor arms shall be subjected to dimensional stability test ( see 5.5.3 and 5.5.4 ).

**5.0.2.4** Five rotor arms shall be subjected to high voltage test ( see 5.9.2 ).

**5.0.2.5** In case of failure for one or more samples the testing authority may call for fresh samples not exceeding twice the number of original samples and subject them to the test(s) in which failure occurred. If in repeat test(s), no failure occurs, the test may be considered to have been satisfied.

**5.0.3 Acceptance Tests ( Distributor Caps and Rotor Arms )** — The following shall constitute acceptance tests:

- a) Visual examination ( see 5.1 ),
- b) Dimensional check ( see 5.2 ), and
- c) High voltage test ( see 5.9 ).

NOTE — The number of samples for acceptance tests shall be as agreed to between the purchaser and the manufacturer. However, a recommended sampling plan is given in Appendix A.

**5.0.4 Routine Test ( Distributor Caps and Rotor Arms )** — The visual examination shall be carried out as routine tests on all distributor caps and rotor arms.

**5.1 Visual Examination** — The distributor caps and rotor arms shall be visually examined and inspected for checking conformity with the relevant requirements specified in this standard.

## 5.2 Dimensional Check

**5.2.1** The overall dimensions of distributor caps and rotor arms shall be as agreed to between the purchaser and the supplier.

**5.2.2** The dimensions of the terminal housing on the distributor caps shall be as given in Fig. 1 or agreed to between the purchaser and the supplier.

## 5.3 Carbonization Test ( for Grade A Caps Only )

**5.3.1** The high voltage source and the test setup for this test shall be according to Fig. 2 and 3.

**5.3.2** Using a high voltage source as indicated in Fig. 2, the high voltage shall be making sure that the spark current is adjusted to and maintained at  $1.5 \pm 0.1$  mA as indicated by the meter.

**5.3.3** The sparking shall be maintained for 15 minutes without carbonizing. Carbonization is indicated by the formation of a conducting path along the surface of the plastic and the disappearance of the spark on all or part of the original flashover path.

## 5.4 Localized Heating Test

**5.4.1** The equipment consists of soldering iron with its tip replaced by a brass probe, 8 mm in diameter and approximately 40 mm long, as a localized heat source. The surface temperature of the soldering iron shall be not less than 150°C.

**5.4.2** The distributor cap shall be tested for the effect of localized heating by inserting the heated brass probe into each tower until it touches the bottom of the insert and shall be held there for one minute. The cap shall not have any crack in the plastic at the end of the test.

## 5.5 Dimensional Stability Test

**5.5.1** The cap shall be inspected for cracks and the pilot diameter shall be measured at the room temperature.

**5.5.2** The cap shall be heated to about 90 to 95°C for 48 hours. After heating, the cap shall be cooled to room temperature. The cap shall not have any crack and the pilot diameter shall not have decreased more than 0.02 mm per centimetre at the end of the test.

**5.5.3** The rotor arm shall be inspected for cracks and the track radius shall be measured at room temperature.

**5.5.4** The rotor arms shall be heated to about 90 to 95°C for 48 hours. After heating, the rotor arms shall be cooled to room temperature. The rotor arms shall not have any crack, and the track radius shall not have increased by more than 0.02 mm per centimetre at the end of the test.

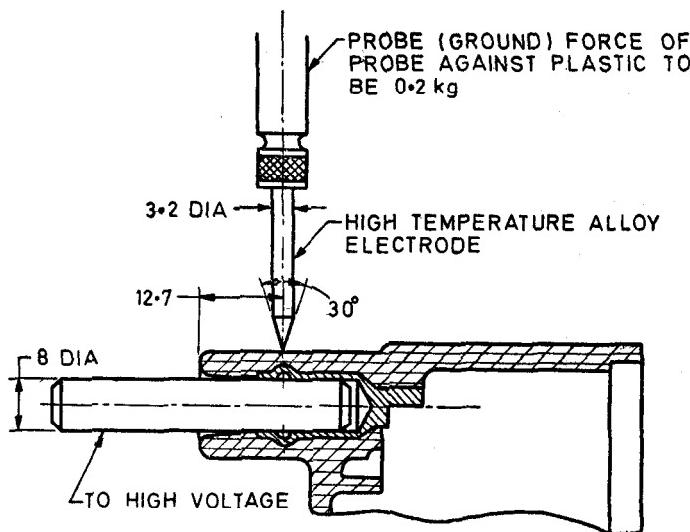


FIG. 2 HIGH VOLTAGE SOURCE FOR CARBONIZATION TEST

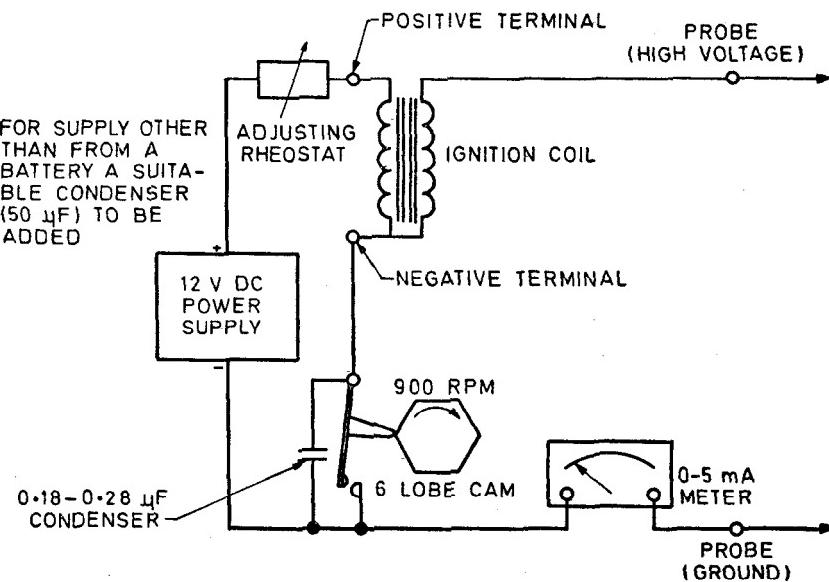


FIG. 3 SCHEMATIC DIAGRAM FOR CARBONIZATION TEST

### 5.6 Wet Surface Resistance Test

**5.6.1** Use distilled water at a temperature of  $90 \pm 5^\circ\text{C}$  in a 600 ml glass beaker (approximately 100 mm in diameter) as the vapour source. The water surface should be about 100 mm below the top edge of the beaker.

**5.6.2** Expose the interior surface of the cap to the water vapour for a period of one minute. The position of the cap shall be between 3 and 12 mm above the top edge of the beaker. Do not let the cap touch the beaker or the temperature of cap increase above  $35^\circ\text{C}$ . Shake the cap vigorously to remove excess moisture. Measure the surface resistance within 12 minutes after the caps are removed from the vapour.

**5.6.3** The wet surface resistance of the caps when measured with an insulation resistance tester having an accuracy of at least 10 percent at 1 000 megohms and an internal test voltage of 500 V, shall not be lower than 100 megohms between any two inserts.

**5.7 High Temperature Resistance Test** — Heat the cap in circulating air oven at  $95 \pm 5^\circ\text{C}$  for at least 30 minutes but not exceeding 60 minutes. The insulation resistance shall be measured at  $95 \pm 5^\circ\text{C}$  with the insulation tester described in **5.6.3**. The insulation resistance thus measured shall exceed 20 megohms between insert to insert and insert to distributor housing.

### 5.8 Wet Internal Resistance Test

**5.8.1** The caps shall be placed for 24 hours at a relative humidity of not less than 95 percent in an ambient temperature of  $40 \pm 5^\circ\text{C}$ . Immediately after the treatment not later than 30 minutes, the insulation resistance shall be measured after removing visible drops of water, if any, with the aid of blotting papers but without heating.

**5.8.2** The insulation resistance shall be measured with an insulation resistance tester as described in **5.6.3** between insert to insert and insert to distributor housing.

**5.8.3** The insulation resistance measured shall not be less than 500 megohms.

### 5.9 High Voltage Test

**5.9.1 High Voltage Test (Distributor Caps)** — The distributor cap when subjected to a voltage of 10 kV rms value at a suitable frequency between 40 Hz and 60 Hz, between each terminal and between the terminal and the part to be earthed after keeping the cap at a temperature of  $80 \pm 5^\circ\text{C}$  for not less than 30 minutes, shall withstand the voltage for not less than 1 minute.

**5.9.2 High Voltage Test ( Rotor Arms )** — The rotor arm when subjected to a voltage of 20 kV rms at a frequency of 50 Hz, between the rotary electrode and the part to be earthed after keeping the rotor arm at a temperature of  $80 \pm 5^\circ\text{C}$  for not less than 60 minutes, shall withstand the voltage for not less than 1 minute.

## APPENDIX A

*( Clause 5.0.3 )*

### **RECOMMENDED SAMPLING PLAN FOR ACCEPTANCE TESTS ( DISTRIBUTOR CAPS AND ROTOR ARMS )**

#### **A-0. GENERAL**

**A-0.1** If statistical quality control techniques have been used for production control, such test results and relevant charts may be made available along with the material supplied to enable the purchaser to judge the acceptability or otherwise of a lot. In case such information is not available, the following procedure is recommended for judging conformity of a lot with the requirement of this specification.

#### **A-1. SCALE OF SAMPLING**

**A-1.1 Lot** — In any consignment, all the distributor caps/rotor arms of the same size and from the same batch of manufacture shall be grouped together to constitute a lot.

**A-1.2** The number of distributor cap/rotor arm to be selected from a lot shall depend upon the lot size and shall be in accordance with col 1 and 2 of Table 1.

**TABLE 1 SAMPLE SIZE AND ACCEPTANCE NUMBER**

LOT SIZE <i>N</i>	SAMPLE SIZE <i>n</i>	ACCEPTANCE NUMBER (3)
(1)	(2)	(3)
Up to 100	13	0
101 ,, 300	20	1
301 ,, 500	32	2
501 ,, 1 000	50	3
1 001 and above	80	5

**A-1.3** These distributor caps/rotor arms shall be selected at random. In order to ensure randomness, the following procedure may be adopted:

Arrange the distributor caps/rotor arms in a systematic manner and starting from any distributor cap/rotor arm, count them as 1, 2, .... ,etc, up to  $r$ ,  $r$  being equal to the integral part of  $N/n$ ,  $N$  being the lot size and  $n$  the sample size. Every  $r$ th distributor cap/rotor arm shall be included in the sample.

## **A-2. NUMBER OF TESTS**

**A-2.1** All the distributor caps/rotor arms selected under **A-1.2** shall be subjected to acceptance tests given in **5.0.3**.

## **A-3. CRITERION FOR CONFORMITY**

**A-3.1** A lot shall be considered as conforming to this specification, if the number of distributor caps/rotor arms out of those tested, failing to satisfy the requirements of any one or more of acceptance tests, does not exceed the corresponding number given in col 3 of Table 1.

# INTERNATIONAL SYSTEM OF UNITS ( SI UNITS )

## Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

## Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

## Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s <sup>2</sup>
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m <sup>2</sup>
Frequency	hertz	Hz	1 Hz = 1 c/s (s <sup>-1</sup> )
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m <sup>2</sup>

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